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Attorney's Docket: 2000FR303
Serial No.: 09/821,876
Art Unit 1711

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REMARKS

ag are concurring

Applicants note from the Advisory action mailed May 27, 2003, that the declaration to disqualify Jacquinot et al USP 6,136,912 was successful. Applicants believe that the only objection to the claims

Applicants believe that the only objection to claims1-16 are under 35 USC § 103(a) as being obvious from Jacquinot JP 11-246789, FR 2 772 777 or EP 0 926 170 A1 in view of Swofford '828. Applicants traverse this rejection. The motivation to modify the prior art must flow from some teaching in the art that suggests the desirability or incentive to make the modification needed to arrive at the claimed invention. *See In re Napier*, 55 F. 3d 610, 613, 34 USPQ 2d 1782, 1784 (Fed. Cir. 1995) ("Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination."); *accord In re Geiger*, 815 F. 2d 686, 688, 2 USPQ 2d 1276, 1278 (Fed. Cir. 1987); *In re Laskowski*, 871 F.2d 115, 117, 10 USPQ 2d 1397, 1399 (Fed. Cir. 1989) ("[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification") (quoting *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)). The Office argues that Swofford discloses a multifunctional acrylate. However the Office ignores that Swofford in column 7 discloses that up to 35 weight percent, preferably 15 to 25 weight percent, based on the total weight of the aqueous dispersion, of lower alkanol may be added to enhance stability. Jacquinot teaches very low solvent water and solvent content. One of ordinary skill would not assume that a multifunctional acyrlate that works in a system that employs up to 35 weight percent volatile organic solvent would work in Jacquinot system of very low solvent and water content.

The Office argues that Applicants arguments are not p rsuasive, yet the Office is merely **picking and choosing** only the facts in these cases, which support the Office's 103 objection and clearly ignoring the pertinent facts which clearly teach away from the combination of references. For purposes of these arguments Applicants note that the Jacquinot JP 11-246789, FR 2 772 777 or EP 0 926 170 A1 references are the foreign equivalents of the Jacquinot '912 reference which has been removed but which is and English equivalent. The Office argues that Jacquinot teach compositions comprising substantial amounts of isopropanol. This is true, and as the Office goes on to state that Swofford uses lower amount of alkanol solvent than Jacquinot, this may also be true. However, what the Office is selectively disregarding is that in the Jacquinot reference ('912 column 4, lines 32-36) is that the Jacquinot alcohol is eliminated through azeotropic distillation under low pressure. In Swofford the alcohol is never eliminated.

The Office avers that Swofford does not mention the residual wt. % water in the disclosed composition. This is not true. Swofford as Applicants point out **again,** in column 7, discloses that up to 35 weight percent, preferably 15 to 25 weight percent, based on the total weight of the aqueous dispersion. The Office seems to be **selectively ignoring all clear and relevant facts**, which clearly teach away from combing the references, in favor of any support, no matter how badly it is taken out of context, which supports the Office's position. The Office now argues that Swofford in example 1, discloses heating a mixture of vinyltrimethoxysilane and the Nalco colloidal silica. What the office fails to say is that the mixture is heated to 60°C. Then the office has the audacity to claim "[a] low residual water content would be expected after hydrolysis of the of the vinyltrimethoxysilane and the colloidal silica." Water has a boil point of 100°C, isopropanol has a boiling point of 82.4°C, heating this mixture to 60°C is not going to significantly effect the level of water or isopropanol in the mixture. Applicants have attached pages from Hawley's Condensed Chemical Dictionary to support the boiling points of water and isopopanol. Further attached are

technical data sheets from Nalco which show that the Colloidal Silica NALCO 1034A taught in Example 1 of Swofford has a % silica of 34% which means that 66% of NALCO 1034A is water or other liquid medium.

The office then goes on to say that "[t]he composition is dried at 75° C and then irradiated to crosslink." What the office selectively leaves out is that this is done to the resulting coating composition, not just the colloidal silica composition.

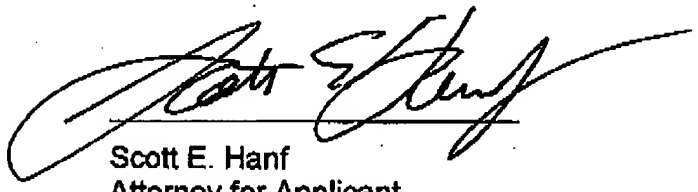
Clearly Jacquinot teaches a colloidal suspension with very low residual water. However, just because both Jacquinot and Swofford teach a composition comprising a mutifunctional acrylate and an alkanol does not make the two references equivalents. One of ordinary skill would not assume that the specific multifunctional acyrlate that works in a system that employs up to 35 weight percent volatile organic solvent would work in Jacquinot system of very low solvent and water content. Applicants respectfully request that the rejections under 35 USC § 103(a) be withdrawn and the claims allowed.

As the total number of claims does not exceed the number of claims originally paid for, no fee is believed due. However if an additional fee is required, the Commissioner is hereby authorized to credit any overpayment or charge any fee deficiency to Deposit Account No. 03-2060.

Attorney's Docket: 2000ER303
Serial No.: 09/821,876
Art Unit 1711

Reconsideration and allowance of this application is respectfully requested.

Respectfully submitted,



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Attachment: Defintions from Hawley's Condensed Chemical Dictionary (6 pages)
Handbook of Chemistry and Physics (3 pages)
Nalco Literature on Colloidal Silica's (2 Pages)

Hawley's

Condensed Chemical

Dictionary

TWELFTH EDITION

Revised by

Richard J. Lewis, Sr.

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water, soluble in alcohol, ether, and hydrocarbon solvents, autoign temperature 802F (427C).
Derivation: (1) From cracked products of heavy petroleum oils, (2) dehydrogenation of isopentene, (3) pyrolysis of methylpentene or of isobutyleneformaldehyde condensation products, (4) dehydration of methyl butenol.
Grade: Polymerization (min purity 99%), research (99.99%).
Hazard: Highly flammable, dangerous fire and explosion risk. Irritant.
Use: Monomer for manufacture of polyisoprene, chemical intermediate, component of butyl rubber.
See also polyisoprene, rubber, natural.

isoprenoid. A compound based on the isoprene structure. These include many naturally occurring materials such as terpenes, rubber, and cholesterol and other steroids.

isopropanol. Legal label name for isopropyl alcohol.

isopropanolamine. (MIPA; 2-hydroxypropylamine; 1-amino-2-propanol). CAS: 78-96-6.
$CH_3CH(OH)CH_2NH_2$.
Properties: Liquid, slight ammonia odor, d 0.9619, mp 1.4C; bp 159.9C, refr index 1.4462 (20C), flash p 170F (76.6C), soluble in water. Combustible.
Use: Emulsifying agent, dry-cleaning soaps, soluble textile oils, wax removers, metal cutting oils, cosmetics, emulsion paints, plasticizers, insecticides.

isopropenyl acetate. CAS: 108-22-5.
$CH_3COOC(CH_3):CH_2$.
Properties: Water white liquid, d 0.9226, bp 97.4C, fp −92.9C, solubility in water 3.25% by wt (20C), refr index 1.4020 (20C), flash p 60F (15.5C) (OC).
Hazard: Flammable, dangerous fire risk.
Use: Acylation reagent.

isopropenylacetylene. (2-methyl-1-buten-3-yne).
$H_2C{=}C(CH_3)C{=}CH$.
Properties: Colorless liquid, bp 33–34C, fp −113C, d 0.695 (20/20C, refr index 1.4168 (20C), flash p below 20F (−6.6C) (TOC). Very slightly soluble in water and miscible with acetone, alcohol, benzene, carbon tetrachloride, and kerosene.
Hazard: Flammable, dangerous fire risk.

isopropenyl chloride. See chloropropene.

isopropenylchloroformate.
$ClCOOC(CH_3):CH_2$.
Properties: Liquid, d 1.103 (20C), bp 93C (746 mm Hg).
Derivation: Distillation of the reaction products of acetone and phosgene.
Hazard: Strong irritant to eyes and skin.

p-isopropoxydiphenylamine.
$C_6H_5NHC_6H_4OCH(CH_3)_2$.
Properties: Dark gray flakes, d 1.10, set point 80–86C, purity 92% (min), ash 0.10% (max). Insoluble in water; soluble in ethanol, acetone, benzene, and gasoline.
Use: Rubber anti-oxidant.

2-isopropoxyethanol. (IPE; isopropyl glycol; isopropyl "Cellosolve"). CAS: 109-59-1.
$(CH_3)_2CHOCH_2CH_2OH$.
Properties: A mobile liquid with mw 104.15, d 0.91, bp 139.5–144.5, vap press 2.6 torr at 20C.
Hazard: Combustible liquid with flash p 49C. TLV: 25 ppm. Toxic by skin absorption.
Use: As a component of lacquers and other coatings, and as a solvent.

o-isopropoxyphenyl-N-methylcarbamate. (propoxur). CAS: 114-26-1.
$(CH_3)_2CHOC_6H_4OOCNHCH_3$.
Properties: White, crystalline powder; odorless; mp 91C. Soluble in most polar solvents, very slightly soluble in water, unstable in highly alkaline media, stable under normal use conditions.
Hazard: Toxic by ingestion and inhalation. TLV: 0.5 mg/m³ of air.
Use: Insecticide, molluscicide.

β-isopropoxypropionitrile.
$(CH_3)_2CHO(CH_2)_2CN$.
Properties: Colorless to straw-colored liquid, combines the chemical and physical properties of ethers and nitriles, fp −67C, bp 82–86C (25 mm Hg) 65–65.5C (10 mm Hg), d 0.9058 (25C), slightly soluble in water, soluble in organic solvents, flash p 155F (68.3C). Combustible.

isopropyl acetate. CAS: 108-21-4.
$CH_3COOCH(CH_3)_2$.
Properties: Colorless liquid, aromatic odor, bp 89.4C, d 0.8690 (25/4C), refr index 1.378 (20C), sp ht 0.46 cal/g, fp −73.4C, heat of vaporization 135 Btu/lb, viscosity (25C) 0.49 cP, solubility in water 2.9 wt %, flash p 40F (4.4C), bulk d 7.17 lb/gal (20C), miscible with most organic solvents, autoign temperature 860F (460C).
Derivation: By reacting isopropyl alcohol with acetic acid in the presence of catalysts.
Grade: 95%, 85–88%.
Hazard: Flammable, dangerous fire risk. TLV: 250 ppm in air.
Use: Solvent for nitrocellulose, resin gums, etc.; paints, lacquers, and printing inks; organic synthesis, perfumery.

isopropylacetone. See methyl isobutyl ketone.

N-isopropylacrylamide. (NIPAM). Crystalline solid; homopolymers and copolymers prepared with this material show inverse solubility in water.
Use: Binders in textiles, paper, adhesives, detergents, cosmetics.
See also acrylic resin.

isopropyl alcohol. (IPA; dimethylcarbinol; sec propyl alcohol; isopropanol; 2-propanol).
CAS: 67-63-0. $(CH_3)_2CH_2O$. 48th highest-volume chemical produced in U.S. (1991).
Properties: Colorless liquid, pleasant odor, bp 82.4C, d 0.7863 (20/20C), refr index 1.3756 (20C), sp ht 0.65 cal/g, fp −86C, critical temperature 235C, critical pressure 53 atm, vap press 33 mm Hg at 20C, flash p 53F (11.7C (TOC), heat of combustion 14,346 Btu/lb, heat of vaporization 288 Btu/lb, viscosity 2.1 cP (25C), autoign temperature 850F (453C). Soluble in water, alcohol, and ether.
Derivation: By treatment of propylene with sulfuric acid and hydrolyzing.
Method of purification: Rectification.
Grade: 91%, 95%, 99%, NF (99%), nanograde.
Hazard: Flammable, dangerous fire risk, explosive limits in air 2–12%. Toxic by ingestion and inhalation. TLV: 400 ppm in air.
Use: Manufacture of acetone and its derivatives, manufacture of glycerol and isopropyl acetate, solvent for essential and other oils, alkaloids, gums, resins, etc.; latent solvent for cellulose derivatives, coatings solvent, deicing agent for liquid fuels, lacquers, extraction processes, dehydrating agent, preservative, lotions, denaturant.

isopropylamine. (2-aminopropane).
CAS: 75-31-0. $(CH_3)_2CHNH_2$.
Properties: Colorless, volatile liquid. Amine odor, strong alkaline reaction, bp 32.4C, fp −101C, d 0.6881 (20/20C), bulk d 5.7 lb/gal (20C), refr index 1.3770 (15C), flash p (OC) −35F (−37.2C), autoign temperature 756F (402C). Miscible with water, alcohol, and ether.
Derivation: From acetone and ammonia under pressure.
Hazard: Highly flammable, dangerous fire risk. Strong irritant to tissue. TLV: 5 ppm in air.
Use: Solvent, intermediate in synthesis of rubber accelerators, pharmaceuticals, dyes, insecticides, bactericides, textile specialties, and surface-active agents, dehairing agent, solubilizer for 2,4-D acid.

p-isopropylaminodiphenylamine. See N-isopropyl-N′phenyl-p-phenylenediamine.

isopropylaminoethanol. (IPAE).
CAS: 109-56-8. A commercial mixture of approximately 60% isopropylethanolamine, $(CH_3)_2CHNHCH_2CH_2OH$, and 40% isopropyldiethanolamine, $(CH_3)_2CHN(CH_2CH_2OH)_2$.
Properties: Amber to straw-colored liquid, distillation range 110–165C, fp approximately −50C, d 0.91–0.94 (20/20C), flash p 145–155F (62.7–68.3C) (OC). Combustible.
Use: Synthesis of emulsifiers.

N-isopropylaniline. CAS: 768-52-5.
$C_6H_5NHCH(CH_3)_2$.
Properties: Yellowish liquid, bp 206C, pour point below −67C, refr index 1.5365 (20C), flash p 190F (87.7C) (COC). Combustible.
Hazard: Toxic by inhalation and skin absorption. TLV: 2 ppm in air.
Use: Dyeing acrylic fibers, chemical intermediate.

p-isopropylaniline. See cumidine.

isopropyl antimonite. $[(CH_3)_2CHO]_3Sb$.
Properties: Colorless liquid, bp 82C at 7 mm Hg pressure.
Derivation: Reaction of antimony trichloride with isopropanol.
Use: Cross-linking agent, flameproofing agent.

isopropylarsine. See "Epigrade" [*Advanced*].

p-isopropylbenzaldehyde. See cuminic aldehyde.

isopropylbenzene. See cumene.

p-isopropylbenzyl alcohol. See cuminic alcohol.

isopropylbiphenyl. See "Tanacol CG" [*Sybron*].

isopropyl bromide. CAS: 75-26-3.
$CH_3CHBrCH_3$.
Properties: Colorless liquid, d 1.304 (25/25C), bp 58.5–60.5C, fp −90C, refr index 1.422 (25C), flash p none, slightly soluble in water, soluble in ethanol and ether. Non-flammable.
Use: Synthesis of pharmaceuticals, dyes, other organics.

isopropyl butyrate. CAS: 638-11-9.
$(CH_3)_2CHOOCC_3H_7$.
Properties: Colorless liquid, d 0.8652 (13C), bp 128C.
Use: Solvent for cellulose ethers, flavoring.

isopropylcarbinol. See isobutyl alcohol.

isopropyl chloride. CAS: 75-29-6.
$CH_3CHClCH_3$.
Properties: Colorless liquid, d 0.858 (25/25C), bp 34.8C, fp −117.6C, refr index 1.374 (25C), flash p −26F (−32.3C), autoign temperature 1100F (593C), slightly soluble in water, soluble in ethanol and ether.

(polystyrene bottles) to render them biodegradable. (6) High-pressure hydrogenation of garbage to yield a low-sulfur combustible oil. (7) Deactivating radioactive wastes by adsorption or ion exchange, as well as by solidification and hydraulic fracturing; high-activity wastes are buried in steel-lined concrete tanks. (8) Catalytic oxidation of waste chlorinated hydrocarbons, with partial recovery of chlorine. (9) Incineration of semi-solid and liquid wastes at sea in ships designed for that purpose.
See also radioactive waste, chemical waste, sewage sludge, urban waste.

waste, hazardous. See chemical waste, radioactive waste.

waste, radioactive. See radioactive waste.

waste wool, wet. See wool waste.

"Watchung" [*Du Pont*]. TM for precipitated diazo red pigments.

water. (ice, steam). H_2O or HOH.
Properties: Colorless, odorless, tasteless liquid. Allotropic forms are ice (solid) and steam (vapor). Water is a polar liquid with high dielectric constant (81 at 17C), which largely accounts for its solvent power. It is a weak electrolyte, ionizing as H_3O^+ and OH^-. At atmospheric pressure it has d 1.00 (4C), fp 0C (32F) and expands about 10% on freezing. Viscosity 0.01002 poise (20C), sp heat 1 calorie/g, vap press 760 mm Hg (100C), triple point 273.16K at 4.6 mm, surface tension 73 dynes/cm at 20C, latent heat of fusion (ice) 80 cal/g, latent heat of condensation (steam) 540 cal/g. Bulk d 8.337 lb/gal, 62.3/lb/cu ft. Refr index 1.333. Water may be superheated by enclosing in an autoclave and increasing pressure; it may be supercooled by adding sodium chloride or other ionizing compound. It has definite catalytic activity, especially of metal oxidation. Physiologically water is classed as a nutrient substance.
Derivation: (1) Oxidation of hydrogen, (2) end product of combustion, (3) end product of acid-base reaction, (4) end product of condensation reaction.
Purification: (1) Distillation, (2) ion-exchange reaction (zeolite), (3) chlorination, (4) filtration.
Use: Suspending agent (papermaking, coal slurries), solvent (extraction, scrubbing), diluent, beer and carbonated beverages, hydration of lime, paper coatings, textile processing, moderator in nuclear reactors, debarking logs, industrial coolant, filtration, washing and scouring, sulfur mining, hydrolysis, Portland cement, hydraulic systems, power source, steam generation, food industry, source of hydrogen by electrolysis and thermochemical decomposition.
See hydrogen. See also ice; steam; heavy water; ocean water; water, hard.

water, bound. See bound water.

water gas. (blue gas). A mixture of gases made from coke, air, and steam. The steam is decomposed by passing it over a bed of incandescent coke, or by high-temperature reaction with natural gas or similar hydrocarbons. Approximate composition: carbon monoxide 40%, hydrogen 50%, carbon dioxide 3%, and nitrogen 3%.
Hazard: Flammable, dangerous fire and explosion risk. Explosive limits 7–72% in air. Toxic by inhalation.
Use: Organic synthesis, fuel gas, ammonia synthesis.
See also synthesis gas.

water glass. See sodium silicate.

water, hard. Water containing low percentages of calcium and magnesium carbonates, bicarbonates, sulfates, or chlorides, as a result of long contact with rocky substrates and soils. Degree of hardness is expressed either as grains per gallon or parts per million (ppm) of calcium carbonate (1 grain of $CaCO_3$ per gal is equivalent to 17.1 ppm). Up to 5 grains is considered soft, over 30 grains is very hard. Hardness may be temporary (carbonates and bicarbonates) or permanent (sulfates, chlorides). Treatment with zeolites is necessary to soften permanently hard water. Temporary hardness can be reduced by boiling. These impurities are responsible for boiler scale and corrosion of metals on long contact. Hard waters require use of synthetic detergents for satisfactory "sudsing."
See also zeolite.

watermark. See dandy roll.

water of crystallization. Water chemically combined in many crystallized substances; it can be removed at or near 100C, usually with loss of crystalline properties.

water pollution. Contamination of fresh or salt water with materials that are toxic, noxious, or otherwise harmful to fish and other animals and to man, including thermal pollution. Disposal of untreated chemical and municipal wastes in streams and rivers has been illegal since the early 1900s; in 1973 the EPA prohibited dumping of all types of wastes into the ocean. Unintentional pollution results from run-off containing toxic insecticidal residues. Oil spills at sea are a continual problem and probably will remain so.
See also waste treatment, oil spill treatment, Environmental Protection Agency, environmental chemistry.

hydroliquefaction. Production of liquid hydrocarbon fuels by hydrogenation of coal.
See gasification; oil/gas process.

hydrolube. A water-glycol base non-combustible hydraulic fluid.

hydrolysis. A chemical reaction in which water reacts with another substance to form two or more new substances. This involves ionization of the water molecule as well as splitting of the compound hydrolyzed, e.g., $CH_3COOC_2H_5 + H_2O \rightarrow CH_3COOH + C_2H_5OH$. Examples are conversion of starch to glucose by water in the presence of suitable catalysts; conversion of sucrose (cane sugar) to glucose and fructose by reaction with water in the presence of an enzyme or acid catalyst; conversion of natural fats into fatty acids and glycerol by reaction with water in one process of soap manufacture; and reaction of the ions of a dissolved salt to form various products, such as acids, complex ions, etc.

hydrolyzed vegetable proteins. See "Hydrotriticum" [*Croda*].

"Hydro-Magma" [*Marine*]. (magnesium hydroxide). CAS: 1309-42-8. TM for magnesium hydroxide added to Milk of Magnesia as an antacid, alkaline buffer, and chemical thickener.
Use: Antacid, alkaline buffer, and chemical thickener in the food, pharmaceutical, cosmetic, rubber, plastics, and adhesives industries.

hydrometer. Device for measuring the density of liquids.
See also Baumé.

hydronium ion. An ion (H_3O^+) formed by the transfer of a proton (hydrogen nucleus) from one molecule of water to another; a companion ion (OH^-) is also formed; the reaction is $2H_2O \rightarrow H_3O^+ + OH^-$. Formation of such ions is statistically rare, resulting from the interaction of water molecules in a ratio of 1:556 million.

hydroperoxide. An organic peroxide having the generalized formula ROOH. An example is ethyl hydroperoxide (C_2H_5OOH). Methyl and ethyl hydroperoxides are unstable and thus are strong oxidizing agents and explosion hazards; those of higher molecular weight are more stable. Hydroperoxides can be derived by oxidation of saturated hydrocarbons, or by alkylating hydrogen peroxide in a strongly acidic environment. They are used as polymerization initiators.

hydrophilic. Having a strong tendency to bind or absorb water, which results in swelling and formation of reversible gels. This property is characteristic of carbohydrates, such as algin, vegetable gums, pectins, and starches, and of complex proteins such as gelatin and collagen.

hydrophobic. Antagonistic to water, incapable of dissolving in water. This property is characteristic of all oils, fats, waxes, and many resins, as well as of finely divided powders like carbon black and magnesium carbonate.

hydroponics. See nutrient solution.

hydroquinol. See hydroquinone.

hydroquinone. (quinol; hydroquinol; p-dihydroxybenzene). CAS: 123-31-9. $C_6H_4(OH)_2$.
Properties: White crystals; soluble in water, alcohol, and ether; d 1.330; mp 170C; bp 285C; flash p 329F (165C); autoign temperature 960F (515.5C). Combustible.
Derivation: Aniline is oxidized to quinone by manganese dioxide and is then reduced to hydroquinone.
Grade: Technical, photographic.
Hazard: Toxic by ingestion and inhalation, irritant. TLV: 2 mg/m³ of air.
Use: Photographic developer (except color film); dye intermediate; inhibitor; stabilizer in paints and varnishes, motor fuels, and oils; antioxidant for fats and oils; inhibitor of polymerization; skin hyperpigmentation.

hydroquinone benzyl ether. See p-benzyloxyphenol.

hydroquinone dibenzyl ether. CAS: 103-16-2. $C_6H_5CH_2OC_6H_4OCH_2C_6H_5$.
Properties: Tan powder; mp 119C (min); purity 90% (min); insoluble in water; soluble in acetone, benzene, and chlorobenzene. Combustible.
Use: Solvent; perfumes, soap, plastics, and pharmaceuticals.

hydroquinone di-n-butyl ether. (1,4-dibutoxybenzene). $C_6H_4[O(CH_2)_3CH_3]_2$.
Properties: White flakes with no appreciable odor; mp 45–46C; bp 124C (1.3 mm Hg), 158C (15.0 mm Hg); insoluble in water; soluble in benzene, acetone, ethyl acetate, and alcohol. Combustible.

hydroquinone diethyl ether. (1,4-diethoxybenzene). $C_6H_4(OC_2H_5)_2$.
Properties: White granular solid with anise-like odor, mp 71–72C, bp 246C. Neither boiling caustic nor acid solution causes any hydrolysis. Absorbs UV light. Insoluble in water; soluble in benzene, acetone, ethyl acetate, and alcohol. Combustible.

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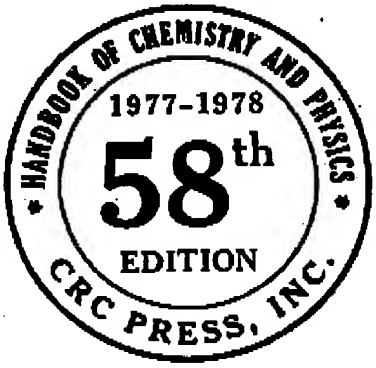

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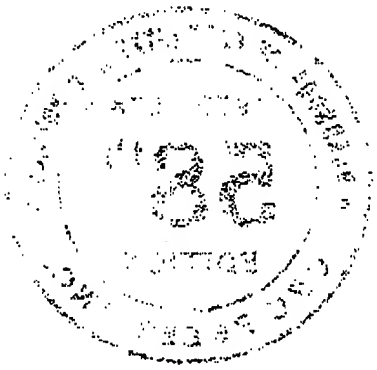

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PHYSICAL CONSTANTS OF INORGANIC COMPOUNDS (Continued)

No.	Name	Synonyms and Formulae	Mol. wt.	Crystalline form, properties and index of refraction	Density or spec. gravity	Melting point, °C	Boiling point, °C	Solubility, in grams per 100 cc: Cold water	Hot water	Other solvents
	Uranyl									
u40	sodium carbonate	$UO_2CO_3.2Na_2CO_3$	542.02	yel cr				sl s		i al
u41	sulfate	$UO_2SO_4.3H_2O$	420.14	yel-grn cr	$3.28^{16.5}$	d 100		$20.5^{15.5}$	22.2^{100}	24.5^{25} conc HCl; 30^{25} conc HCl
u42	sulfate	$2(UO_2SO_4).7H_2O$	858.29	yel		anh 300		sl s		s H_2SO_4
u43	sulfide	UO_2S	302.09	brn-blk, tetr		d 40-50		sl s	s d	s dil a; dil ... $(NH_4)_2CO_3$; i abs al
u44	sulfite	$UO_2SO_3.4H_2O$	422.15	pa-gr cr						s H_2SO_3
v1	Vanadic acid, meta-	HVO_3	99.95	yel sc				i		s a; alk; NH_4...
v2	tetra-	$H_2V_4O_{11}$	381.78	br amorph				i		s a, alk, NH_4OH
v3	Vanadium	V	50.942	lt gray met, cub, 3.03	5.96	1890 ± 10	3380	i	i	s aq reg HNO_3, H_2SO_4, HF; i HCl, alk
v4	boride, di-	VB_2	72.56	hex	5.10					
v5a	bromide, tri-	VBr_3	290.67	grn-blk, deliq	4.00^{18}	d		s		s al; eth; i ...
v5b	carbide	VC	62.95	blk, cub	5.77	2810	3900	i		s HNO_3 fus KNO_3; i HCl, H_2SO_4
v6	chloride, di-	VCl_2	121.85	grn, hex, deliq	3.23^{18}			s d	s d	s al, eth
v7	chloride, tetra-	VCl_4	192.75	red-br liq	1.816^{30}	−28 ± 2	148.5^{755}	s d		s abs al, eth, chl, acet a
v8	chloride, tri-	VCl_3	157.30	pink cr, deliq	3.00^{18}	d		s d	s d	s abs al, eth
v9	fluoride, penta-	VF_5	145.93		2.177^{19}		111.2^{758}			s al
v10	fluoride, tetra-	VF_4	126.94	br yel	2.975^{23}	d 325		s		s acet; sl s al
v11	fluoride, tri-	VF_3	107.94	grn, rhomb	3.363^{19}	>800	subl	i		i al, chl, CS_2
v12	fluoride, tri-	$VF_3.3H_2O$	161.98	dk gr, rhomb		−3H_2O, 100		s	v s d	i abs al
v13	iodide, di-	VI_2	304.71	vi-rose, hex	5.44	750-800 subl vac		s		i al, CCl_4, CS_2
v14	iodide, tri-	$VI_3.6H_2O$	539.75	gr cr, deliq		d		v s		s al
v15	nitride	VN	64.95	blk, cub	6.13	2320		i		sl s aq reg
v16	oxide	VO (or V_2O_2)	66.94	lt gray cr	5.758^{14}	ign		i	i	s a
v17	oxide, di- (or tetr)-	VO_2 (or V_2O_4)	82.94	bl cr	4.339	1967		i	i	s a, alk
v18	oxide, pent-	V_2O_5	181.88	yel-red, rhomb, 1.46, 1.52, 1.76	3.357^{18}	690	d 1750	0.8^{20}		s a, alk; i abs al
v19	oxide, sesqui	Vanadium trioxide. V_2O_3	149.88	blk cr	4.87^{18}_{4}	1970		sl s	s	s HNO_3, HF, alk
v20	oxybromide	VOBr	146.85	vit, oct	4.00^{18}	d 480		v sl s		s acet, anhydr; eth; acet
v21	oxy di-bromide	$VOBr_2$	226.76	br powd, deliq		d 180		s		
v22	oxytribromide	$VOBr_3$	306.67	red liq	$2.933^{14.5}$	d 180	130^{100}	s		
v23	oxychloride	VOCl	102.39	yel brn powd	2.824, 3.64^{20}		127	i		v s HNO_3
v24	oxydichloride	$VOCl_2$	137.85	grn, deliq	2.88^{13}			d		s dil HNO_3
v25	oxytrichloride	$VOCl_3$	173.30	yel liq	1.829	−77 ± 2	126.7	s d		s al, eth, ac acet
v26	oxydifluoride	VOF_2	104.94	yel	3.396^{19}	d				sl s acet
v27	oxytrifluoride	VOF_3	122.94	yel-wh, hygr	2.459^{19}	300	480			
v28	silicide, di-	VSi_2	107.11	met pr	4.42			i	i	s HF; i al, eth
v29	(di-)silicide	V_2Si	129.97	silv wh pr	5.48^{17}			i	i	s HF; i al, eth
v30	sulfate (hypovanadous)	$VSO_4.7H_2O$	273.11	vit, monocl		d in air				
v31	sulfide, mono- or (di-)	VS (or V_2S_2)	83.01	blk pl (moist ?)	4.20	d				s hot H_2SO_4, HNO_3; sl s KOH; i HCl, alk
v32	sulfide, penta-	V_2S_5	262.20	blk-grn powd	3.0	d		i		s HNO_3, alk sulf, alk
v33	sulfide, sesqui- or (tri-)	V_2S_3	198.08	grn-blk pl, or powd	4.72^{21}	d>600		i		s alk sulf; sl s alk, HCl; HNO_3, H_2SO_4
v34	Vanadyl sulfate	$VOSO_4$	163.00	bl				v s		
w1	Water	H_2O	18.01534	col liq, or col hex cr	liq 1.000^4 sol 0.9168	0.00	100.00			s al
w2	Water heavy	Deuterium oxide, D_2O	20.03	col liq or hex cr, 1.32844^{20}	1.105^{25}_{4}	3.82	101.42	∞	∞	∞ al; sl s eth
w3	Wolfram	See tungsten.								
	[illegible]				±0.009 liq 3.52^{-109} solid 2.7^{-140}			11.9^{24} cm^3	7.12^{50}	
y1	Ytterbium	Yb	173.04	cub	6.9654 up to 789 6.54 above 789	819±5	1194	i		s a
y2	(III) acetate	$Yb(C_2H_3O_2)_3.4H_2O$	422.24	hex pl	2.09	−4H_2O, 100		v s	v s	
y3	(II) bromide	$YbBr_2$	332.86		5.91^{20}_{4}	677	1800	s	s	s dil a

[redacted]

Program Profil

Colloidal Silica

NALCO

PR-77

General Description

Nalco colloidal silicas are stable dispersions of nanometer size silica particles in water or other liquid medium. Colloidal silica is valuable in many applications ranging from binders for refractories to adsorbents for haze removal in beverages. A wide spectrum of Nalco colloidal silicas has been developed to meet your needs.

Colloidal silica particle sizes range from four to 100 nanometers in diameter. These sub-micron-sized spheres provide very large surface areas, up to 750 square meters per gram of silica solids, which can dramatically impact the binding and reinforcing properties of many organic or inorganic systems.

The surface of the particle is composed of silanol groups which are partially ionized. A counter ion is present as a stabilizer and the resulting system is in equilibrium. The negative charges on the particle surface provide the repulsive forces that are responsible for preventing the particles from colliding and agglomerating.

Nalco colloidal silicas differ from silica powders (fumed, precipitated and gels). Because Nalco colloidal silicas are non-agglomerated and are already dispersed in a liquid medium, there is no mixing or dilution required. Nalco products vary in the type and amount of counter ion, particle size, pH, silica concentration and surface modification.

Product Applications

The principal uses of colloidal silica include binder support and silica support for catalysts, binder or coating for high temperature insulation, abrasion-resistant and adhesion-promoting additive for various polymeric coatings, detackifying and anti-blocking agent for organic films, source for pure silica and an antislip agent for wax emulsion formations.

Refractories/Ceramics

Because of the very large surface areas and high temperature resistance, colloidal silica is an efficient binder for refractories and special types of ceramics.

Catalysts

The large surface area of colloidal silica, teamed with predictable particle size and particle distribution, provides a silica source, porosity and binder support in many catalyst applications.

Protective Coatings/Inks

Colloidal silica may be added to protective coatings to prevent weathering and corrosion of metal surfaces. The silica produces a film-forming binder by reacting with the metals and metallic salts in the coating. Inks react in a manner similar to coatings. Additionally, colloidal silica can often serve as a friction aid in inks.

NALCO CHEMICAL COMPANY
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SUBSIDIARIES IN ARGENTINA, AUSTRIA, BRAZIL, CHILE, COLOMBIA, ECUADOR, FINLAND, FRANCE, HOLLAND, HONG KONG, ITALY, JAPAN, PHILIPPINES, SAUDI ARABIA, SPAIN, SWEDEN, TAIWAN, USA, VENEZUELA AND WEST GERMANY • AFFILIATES IN AUSTRALIA, CANADA, INDIA, INDONESIA, MEXICO, SINGAPORE, SOUTH AFRICA, THE UNITED KINGDOM, AND USA.

[redacted]

NALCO COLLOIDAL SILICAS

General Product Information
(Typical Values Only)

Same as 1042

Product:	Nalco® 1115	Nalco® 2326	Nalco® 1130	Nalco® 1030	Nalco® 1140	Nalco® 1034A	Nalco® 1040	Nalco® 2327	Nalco® 1050	Nalco® 1060	Nalco® 2329
Particle Size (nm)	4	5	8	13	15	20	20	20	20	60	75
Surface Area (M^2/gm)	750	600	375	230	200	150	150	150	150	50	40
% Silica (as SiO_2)	15	15	30	30	40	34	40	40	50	50	40
pH (@ 25°C)	10.5	9.0	10.0	10.2	9.7	2.8	9.0	9.3	9.0	8.5	8.4
Specific Gravity	1.10	1.09	1.21	1.20	1.29	1.23	1.29	1.29	1.39	1.39	1.29
Viscosity (Centipoise)	<10	<10	<10	<10	15	<10	15	20	55	15	10
Stabilizing Ion	Sodium	Ammonium	Sodium	Sodium	Sodium	–	Sodium	Ammonium	Sodium	Sodium	Sodium
Approx. Na_2O, %	0.75	0.02	0.45	0.50	0.45	0.04	0.45	0.08	0.40	0.35	0.30
Surface Charge	Negative	Negative	Negative	Negative	Negative	Slightly Negative	Negative	Negative	Negative	Negative	Negative

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